

WHAT IS CLAIMED IS:

- 1 1. A method for monitoring a battery installed in a vehicle comprising:
2 utilizing a system provided within the vehicle to determine that a test of the
3 battery should be performed when a first condition is satisfied;
4 electrically coupling at least one vehicle load to the battery; and
5 utilizing the system to analyze the response of the battery to the at least one
6 vehicle load coupled to the battery;
7 whereby the system may be utilized to determine the state of health of the
8 battery.
- 1 2. The method of Claim 1 wherein the system provided within the vehicle
2 comprises a battery monitoring and management system.
- 1 3. The method of Claim 1 wherein the step of determining that a test of the
2 battery should be performed comprises determining that the battery has been newly installed
3 in the vehicle.
- 1 4. The method of Claim 3 wherein the step of determining that a test of the
2 battery should be performed comprises receiving an input signal from an input device
3 indicating that the battery is newly installed in the vehicle.
- 1 5. The method of Claim 3 wherein the step of determining that a test of the
2 battery should be performed comprises inferring that the battery is newly installed in the
3 vehicle.
- 1 6. The method of Claim 5 wherein the step of inferring that the battery is newly
2 installed in the vehicle comprises determining that at least one vehicle system has lost power.
- 1 7. The method of Claim 6 wherein the step inferring that the battery is newly
2 installed in the vehicle further comprises testing the battery and comparing results of the
3 testing with results of testing prior to the power loss to determine that a different battery has
4 been installed.

1 8. The method of Claim 1 wherein the step of determining that a test of the
2 battery should be performed comprises determining that a predetermined amount of time has
3 passed.

1 9. The method of Claim 8 wherein the predetermined amount of time comprises
2 a predetermined amount of time since the battery was last used.

1 10. The method of Claim 1 wherein the step of determining that a test of the
2 battery should be performed comprises determining that the battery has been used for a
3 predetermined number of vehicle starts.

1 11. The method of Claim 1 wherein the step of determining that a test of the
2 battery should be performed comprises determining that the vehicle has experienced a
3 predetermined number of weak starts.

1 12. The method of Claim 1 wherein the step of determining that a test of the
2 battery should be performed comprises determining that the battery has been cycled a
3 predetermined number of times.

1 13. The method of Claim 1 wherein the first condition comprises at least one of a
2 voltage level of the battery approaching a predetermined threshold, the current level of the
3 battery approaching a predetermined threshold, and a slope of the voltage of the battery with
4 time approaching a predetermined threshold.

1 14. The method of Claim 1 wherein the step of electrically coupling at least one
2 vehicle load to the battery comprises sending a signal from the system to couple the at least
3 one vehicle load to the battery.

1 15. The method of Claim 1 wherein the step of electrically coupling at least one
2 vehicle load to the battery comprises electrically coupling at least one relatively low current
3 load and at least one relatively high current load to the battery.

1 16. The method of Claim 15 wherein the step of electrically coupling at least one
2 relatively low current load and at least one relatively high current load to the battery
3 comprises applying a first load to the battery, removing the first load from the battery, and
4 applying a second load to the battery.

1 17. The method of Claim 15 wherein the step of electrically coupling at least one
2 relatively low current load and at least one relatively high current load to the battery
3 comprises concurrently applying both the low current load and the high current load to the
4 battery.

1 18. The method of Claim 15 wherein the relatively high current load is between
2 approximately 3 and 20 amperes and the relatively low current load is between approximately
3 20 and 100 amperes.

1 19. The method of Claim 1 wherein the at least one vehicle load comprises at least
2 one load applied by a device selected from the group consisting of a window defroster, an air
3 conditioning system, a windshield wiper motor, a vehicle seat heater, a vehicle seat
4 adjustment mechanism, and a vehicle entertainment system.

1 20. The method of Claim 1 wherein the at least one vehicle load comprises at least
2 one load resulting from an extended engine crank.

1 21. The method of Claim 1 wherein the at least one vehicle load comprises at least
2 one load provided by a sensor coupled to a vehicle communication system.

1 22. The method of Claim 21 wherein the sensor coupled to a vehicle
2 communication system comprises a current sensor.

1 23. The method of Claim 1 wherein the step of analyzing the response of the
2 battery to the at least one vehicle load coupled to the battery comprises analyzing the voltage
3 response of the battery to the at least one vehicle load.

1 24. The method of Claim 1 wherein the step of analyzing the response of the
2 battery to the at least one vehicle load coupled to the battery comprises analyzing the current
3 response of the battery to the at least one vehicle load.

1 25. The method of Claim 1 wherein the step of analyzing the response of the
2 battery to the at least one vehicle load coupled to the battery comprises analyzing the charge
3 current acceptance of the battery when the engine of the vehicle is in operation and the
4 alternator is providing sufficient voltage to charge the battery.

1 26. The method of Claim 1 wherein the step of analyzing the response of the
2 battery to the at least one vehicle load coupled to the battery comprises comparing an input
3 signal received from the battery to historical information for the battery.

1 27. The method of Claim 1 wherein the step of analyzing the response of the
2 battery to the at least one vehicle load coupled to the battery comprises comparing an input
3 signal received from the battery to information included in a lookup table.

1 28. The method of Claim 1 further comprising providing an output signal if the
2 battery is determined by the system to satisfy a second condition.

1 29. The method of Claim 28 wherein the output signal comprises a signal to
2 disconnect one or more loads from the battery.

1 30. The method of Claim 28 wherein the output signal comprises at least one
2 signal selected from the group consisting of a signal to instruct a voltage regulator to apply a
3 greater charge to the battery and a signal to alter the idle speed of the vehicle.

1 31. The method of Claim 28 wherein the output signal is at least one of a visual
2 and an audible signal.

1 32. The method of Claim 28 wherein the step of providing an output signal if the
2 battery is determined by the system to satisfy a second condition comprises determining that
3 the battery cannot support engine cranking for a predetermined amount of time.

1 33. The method of Claim 28 wherein the step of providing an output signal if the
2 battery is determined by the system to satisfy a second condition comprises determining that
3 at least one of the current and the voltage of the battery declines during application of the at
4 least one vehicle load by a predetermined amount.

1 34. The method of Claim 28 wherein the output signal comprises at least one of a
2 visual signal and an audible signal.

1 35. A system for monitoring a vehicle battery using a method as recited in any of
2 the preceding claims, the system comprising:
3 a battery installed within a vehicle;

4 a system that may be selectively electrically coupled to the battery for carrying
5 out the method; and

6 a vehicle electrical system comprising a plurality of loads that may be
7 selectively electrically coupled to and decoupled from the battery.

1 36. The system of Claim 35 wherein the vehicle electrical system comprises a
2 plurality of relatively high current loads and a plurality of relatively low current loads.

1 37. The system of Claim 35 wherein the plurality of loads comprise at least one
2 vehicle load selected from the group consisting of a window defroster, an air conditioning
3 system, a windshield wiper motor, a vehicle seat heater, a vehicle seat adjustment
4 mechanism, a vehicle entertainment system, and a sensor coupled to a vehicle communication
5 system.